

Integrating ISHM with Flight Avionics Architectures for Cyber-Physical Space Systems, Phase II

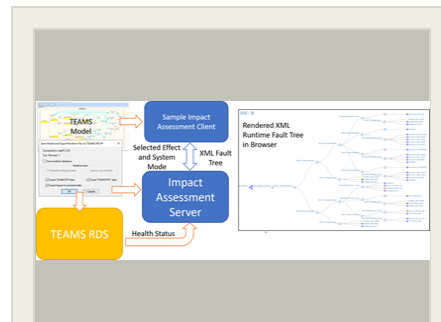
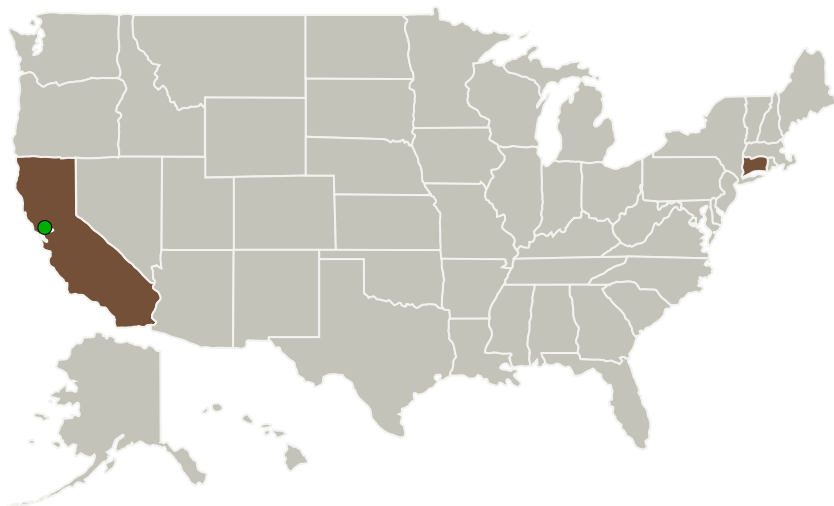
Completed Technology Project (2017 - 2019)



Project Introduction

Substantial progress has been made by NASA in integrating flight avionics and ISHM with well-defined caution and warning system, however, the scope of ACAW alerting and response systems is still limited to a single failure response mapping. While the approach of single Caution And Warning (CW) message mapped to a single response procedure may be sufficient for simple cases, for a well-connected system with inter-dependencies among the components a single component failure will likely negatively impact other components functions downstream that are dependent on the failed component. This may lead to the generation of multiple CW messages and hence the potential invocation of multiple conflicting malfunction and response and recovery procedures. QSI is proposing, with significant feedback from the NASA COR and other NASA stakeholders, on a more proactive approach that improves the CW message generation itself and produces a more appropriate, prioritized and actionable set of CW messages through the identification of the root cause failures, impact or consequence analysis of those failures and the associated risk assessment all of which are critical to the choice for the appropriate response/recovery procedure(s). The proposed solution will provide real-time capability to assess the health and its impact on the capability of a spacecraft, and utilize it to identify suitable recovery options to ensure crew safety and mission success. It will enable smarter crew displays that tie together System Health, Advanced Caution Advisory and Warning System (ACAWS) messages and recommended recovery procedures, thereby improving the decision-making ability of the crew for deep space missions.

Primary U.S. Work Locations and Key Partners



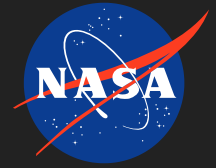
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Organizations Performing Work	Role	Type	Location
Qualtech Systems, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Rocky Hill, Connecticut
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations

California	Connecticut
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Project Transitions

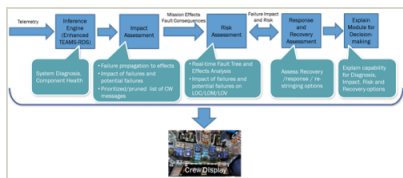
April 2017: Project Start

July 2019: Closed out

Closeout Documentation:

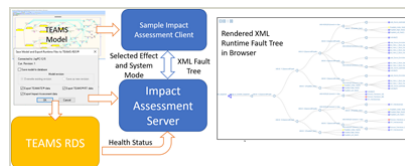
- Final Summary Chart(<https://techport.nasa.gov/file/141027>)

Images



Briefing Chart Image

Integrating ISHM with Flight Avionics Architectures for Cyber-Physical Space Systems, Phase II
Briefing Chart Image
(<https://techport.nasa.gov/image/128417>)



Final Summary Chart Image

Integrating ISHM with Flight Avionics Architectures for Cyber-Physical Space Systems, Phase II
(<https://techport.nasa.gov/image/129801>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Qualtech Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

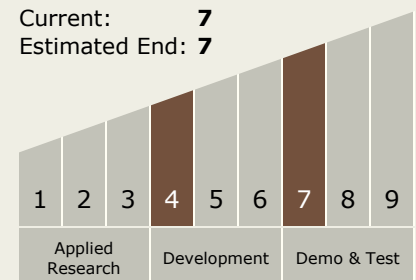
Carlos Torrez

Principal Investigator:

Sudipto Ghoshal

Technology Maturity (TRL)

Start: 4
Current: 7
Estimated End: 7



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Technology Areas

Primary:

- TX10 Autonomous Systems
 - └ TX10.2 Reasoning and Acting
 - └ TX10.2.2 Activity and Resource Planning and Scheduling

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System